

CLAIMS

What is claimed is:

1. A synchronizer for connecting a first drive with either of axially spaced apart second and third drives disposed for relative rotation about an axis of the first drive and axially fixed relative thereto; the synchronizer including:

a hub concentrically fixed to the first drive between the third and fourth drives (14, 16)
5 and including external splines;

first and second jaw teeth respectively fixed to the third and fourth drives;

a shift sleeve including internal splines mating with the external splines and having third and fourth jaw teeth respectively engagable with the first and second jaw teeth in response to to-or-fro axial engaging movement of the sleeve from a neutral position by a
10 shift force (F_o);

first and second friction surfaces respectively fixed to the second and third drives and engagable respectively with first and second friction rings axially disposed on opposite sides of the hub for producing a synchronizing torque when engaged;

first and second blocker surfaces operative when engaged respectively by third and
15 fourth blocker surfaces to prevent engagement of the first and second jaw teeth respectively with the third and fourth jaw teeth prior to the synchronizing;

pre-energizing means for engaging the first and second friction rings respectively with the first and second friction surfaces with an initial engaging force in response to initial to-or-fro engaging movement of the sleeve by the shift force (F_o) from the neutral position and for
20 engaging the blocker surfaces in response to the synchronizing torque

first and second self-energizing surfaces fixed to the hub and separated by non-self-energizing surfaces and third and fourth self-energizing surfaces separated by non-self-energizing surfaces, the first and second self-energizing surfaces operative to react the synchronizing torque when engaged respectively with the third and fourth self-energizing
25 surfaces for producing an additive axial force (F_a) in the direction of the shift force (F) and for increasing the engagement force of the first and second friction rings, and the first and second non-self-energizing surfaces operative when engaged to prevent engagement of the self-energizing surfaces;

a member mounted on the sleeve for non-radial and limited rotational movement
30 relative thereto and having the third and fourth blocker surfaces and the third and fourth self-energizing surfaces fixed thereto;

the pre-energizing means including first and second ramps biased by resilient means

to a position between axially spaced apart third and fourth ramps fixed to the member and respectively engagable in response to the initial to-or-fro engaging movement; and

35 detent means resiliently reacting between the hub and sleeve for positioning the sleeve in the neutral position and the non-self-energizing surfaces for engagement.

2. The synchronizer of claim 1, wherein:

the hub includes an annular flange defining the external splines and has a radially extending bore extending there through ; and

5 the detent means includes resilient means disposed in the bore and biasing a follower radially outward toward engagement with a detent in the sleeve.

3. The synchronizer of claim 2, wherein:

the detent is formed in a radially inward facing portion of one of the internal splines (38).